

Magnetic structure of sites of braiding in Hi-C active region

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Abstract:

High-resolution Coronal Imager (*Hi-C*) observations of an active region (AR) corona, at a spatial resolution of 0.2 arcsec, have offered the first direct evidence of field lines braiding, which could deliver sufficient energy to heat the AR corona by current dissipation via magnetic reconnection, a proposal given by Parker three decades ago. The energy required to heat the corona must be transported from the photosphere along the field lines. The mechanism that drives the energy transport to the corona is not yet fully understood.

To investigate simultaneous magnetic and intensity structure in and around the AR in detail, we use SDO/HMI+AIA data of ± 2 hours around the 5 minute Hi-C flight. In the case of the QS, work done by convection/granulation on the inter-granular feet of the coronal field lines probably translates into the heat observed in the corona. In the case of the AR, as here, there could be flux emergence, cancellation/submergence, or shear flows generating large stress and tension in coronal field loops which is released as heat in the corona. However, to the best of our knowledge, there is no observational evidence available to these processes. We investigate the changes taking place in the photospheric feet of the magnetic field involved with brightenings in the Hi-C AR corona. Using HMI 45s magnetograms of four hours we find that, out of the two Hi-C sub-regions where the braiding of field lines were recently detected, flux emergence takes place in one region and flux cancellation in the other. The field in these sub-regions are highly sheared and have apparent high speed plasma flows at their feet. Therefore, shearing flows plausibly power much of the coronal and transition region heating in these areas of the AR. In addition, the presence of large flux emergence/cancellation strongly suggests that the work done by these processes on the pre-existing field also drives much of the observed heating.

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